

Abstract Submitted
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Turbulent Flows Over Three-Dimensional Shark Skin¹ AARON BOOMSMA, University of Minnesota, LI WEN, GEORGE LAUDER, Harvard University, FOTIS SOTIROPOULOS, University of Minnesota — Shark skin is covered with thousands of small tooth-like structures called denticles. It has long been hypothesized that denticles act as riblets do in a turbulent boundary layer and help reduce friction drag and enhance shark swimming efficiency. We employ the Curvilinear Immersed Boundary (CURVIB) method (Ge and Sotiropoulos, J. Comp. Physics, 2008) to carry out high-resolution large eddy simulations of turbulent flow past a series of anatomically realistic shark denticles mounted on a flat plate. The denticle shapes used in our simulations were obtained by scanning Mako Short Fin shark skin with micro-CT. The computed results are analyzed to elucidate the three-dimensional structure of the flow past the denticles and identify possible drag reduction mechanics. Drag measurements obtained in a laboratory flume for various denticle spacings and arrangements are also reported and analyzed in tandem with the LES results to explore similarities between shark skin and engineered riblets.

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